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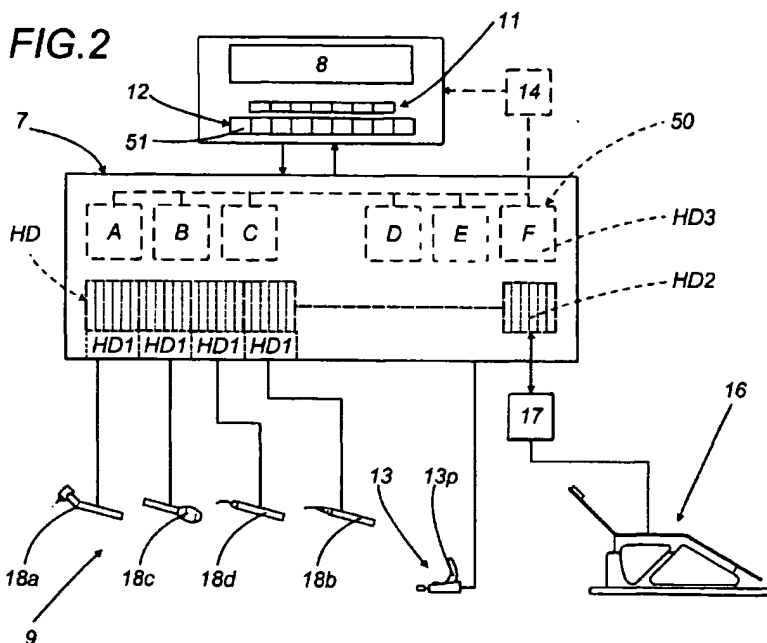
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(54) Enhancement to an activation and monitoring system of a dental unit

(57) An enhancement to an activation and monitoring system of a dental unit provides for a microprocessor unit (7) to be equipped with means (50) for recording a third setting level (HD3) comprising a plurality of user groups (A, B,...N) independent from each other and each of which comprises a related first and second setting level (HD1, HD2) selected by an individual operator through a related recognition means (14) acting on the

microprocessor unit (7); said microprocessor unit (7) is also acted upon by means (15) for the forced alignment of major equipment items (9), which can be activated through related means (51), and able to position operating modes (S1, S2, S3, S4...Sn) of the second setting level (HD2) of each equipment item (9) on the corresponding operating mode selected on the first major piece of equipment (9) drawn by the operator.



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## Description

The present invention relates to an enhancement to an activation and monitoring system for a dental unit.

Currently, in the technical field pertaining to the construction of dental units, particular care and attention is dedicated to the study of specific electronic and computer systems allowing the activation and control, continuous and in real time, of all the functions present on the same unit in the course of dental care sessions.

These functions, in the form of specific data for each type of operating handpiece or accessory tool, are grouped together and stored thanks to the systems using microprocessors connected both to displays allowing the data to be read, and to sensor sets allowing to highlight parts being used or standing by.

A solution of this kind (by the same Applicant, see patent application BO95A000132) comprises a console equipped with a microprocessor and integrated in a tablet or handpiece holder of the dental unit.

The console is provided with a display wherein there is a first portion defining viewing fields, in a fixed number, of operating function data of the dental unit, or scroll-through view fields showing accessory function data along a line of the display itself. To these accessory function data is combined a corresponding series of first push-buttons for the variation - activation of the operating function data or of the passing fields, located outside the display, correlated to the fixed viewing fields, and activating the function corresponding to the viewing field displayed each time.

There is also a series of second push-buttons for the variation - activation of a second portion comprising the remainder of the display and defining a part of the viewing fields of accessory function data which may also not depend on the type of screen used each time.

In other words, as can also be seen in Figure 1, if the physician draws a handpiece from the holder, the microprocessor recognises the type of handpiece which has been drawn (thanks to sensors suitably placed on the holder), and on the display a screen pertaining to that handpiece appears: for instance if the handpiece is a turbine 1, that screen will display, on the first portion 2, operating data regarding number of rpm 3, power output 4, etc., whilst in a portion of the fields of the underlying string 5 are displayed the scales of increase or decrease 6 or of activation of the rotation 6a, by means of the aforesaid corresponding first push-buttons, of the operating data of the handpiece. On the remaining fields of the display and in the remaining fields of the aforesaid string 5 are instead shown accessory and general data of the dental unit, such as operation of lamp 6b, activation of water to the cup and spittoon 6c, water temperature 6d, liquids and air supply to the handpiece 6e, 6f, etc.

The latter selection and setting performed by the physician on the individual handpiece remains stored in the microprocessor memory after the handpiece itself is

placed back in the handpiece holder and even when the dental unit is totally shut off. Thanks to this solution, the handpiece picked up again in the course of the same session or after an interval of time remains set in the last configuration selected by the physician, thus allowing the latter to find the tool in the same operating configuration used up to that time.

In order further to broaden and optimise the operating and treatment options available to the physician, the microprocessor stores a series of memory banks, or operating modes in parallel for each of these handpiece, in order quickly to move from one mode to another one, better suited to the treatment to be performed at that moment.

The Applicant, while experimenting the overall solution described above which led to a production phase, has enhanced the control system of the dental unit adding some functions which are more capable of meeting the physician's actual requirements: this also conceiving the use of the dental unit by several physicians within the same dental care organisation and completing the system itself with controls allowing a quick and practical alignment of the dental unit to the most immediate needs of the physician without his or her having to waste time performing time consuming and laborious setting operations. The technical characteristics of the invention, according to the aforesaid purposes, can clearly be seen from the content of the claims reported below and its advantages shall be made more evident in the description that follows, made with reference to the enclosed drawings, which show an embodiment provided purely by way of non limiting example, in which:

- Figure 1 shows an operating display of the activation and monitoring system enclosed in the Italian patent application BO96A000132;
- Figure 2 shows a first general diagram of the operational and management functions of the enhancement to the system of activation and monitoring constituting the object of the present invention on a dental unit;
- Figure 3 shows an additional, more detailed diagram of a series of levels of possible settings which can be performed with the subject enhanced system;
- Figures 4 and 5 show two flow charts illustrating respective possible operating configurations of the subject enhanced operating system.

According to the figures of the attached drawings, and with particular reference to Figure 2, the subject enhancement pertains to an activation and monitoring system of a dental unit which is not shown in its entirety as it is well known in the prior art.

Part of this system moreover is not fully mentioned and it is only schematically shown in the parts not involved with the subject enhancement, since it is already comprised in an Italian patent application

BO95A000132 by the same Applicant.

The subject system allows to provide the dental unit with a microprocessor unit 7 which monitors the dental unit itself and is connected to and acts upon a display 8 for displaying screens of operating function data related to major equipment items 9, and of accessory function data related to auxiliary equipment 10 (such as a cup and a spittoon shown in the display in Figure 1) which do not depend on the screen displayed each time.

These major equipment items 9 are shown, purely by way of example, in Figures 2 and 3 with four handpieces which define a known micromotor 18a, a syringe 18b, a turbine 18c and a tartar removal tool 18d.

As can be seen in Figure 1, such data are placed within related viewing fields present in the display 8 and can be varied by means of first and second activation - variation means 11 and 12, shown schematically in Figure 2 with a series of push-buttons (preferably of the "no touch" type), which are connected to the microprocessor unit 7 in order to accomplish the aforesaid variation according to the type of operation to be performed.

The microprocessor unit 7, moreover, is connected with means 13 for the command and direct activation of the major equipment items selected and of the auxiliary equipment 9 and 10; means 13 which are shown in Figure 2 with a known pedal set 13p.

To the microprocessor unit 7 is associated a memory unit HD which can record a first setting level HD1 for each handpiece 18 present; this first setting level HD1 comprises the last screen related to operating function data and accessory function data activated in correspondence with a last selection of the corresponding handpiece 18; in this way, when the physician draws the same handpiece 18 anew, the last screen selected is called up with the related data. In addition to this first setting level, the aforesaid memory unit HD can provide for the recording of a second setting level HD2, also for each handpiece 18, comprising a series of operating modes, indicated as S1, S2, S3, S4...Sn, related to different operating function data and accessories each "dedicated" to a particular treatment, similar and independent one from the other, which can be called up progressively and displayed by means of the aforesaid first activation - variation means 11.

As can be seen in Figure 2, the microprocessor unit 7 is provided with means 50 for recording a third setting level HD3, which comprises a plurality of user groups A, B...N independent from each other and each of which provides for a related first and second setting level HD1 and HD2 selected by an individual operator. This third level HD3 (shown more in detail in Figure 3 wherein only a third level HD3 is shown and indicated as A) can be activated by a related recognition means 14 acting on the microprocessor unit 7, which can comprise, for instance, a specific password that can be typed by means of the related keys positioned below the display 8, through which the third level HD3 of the related user A, B...N is entered, or else a magnetic recognition key. In

other words, within the dental unit it is possible simultaneously to group multiple personalised settings of corresponding physicians who work thereon, each activating the related setting at the time he or she begins to work on the dental unit.

Figures 4 and 5 show, designated as 15, means for the forced alignment of the major equipment items 9 (i.e. of the handpieces 18), which can be activated through the related means S1, which in turn can comprise an appropriate push button of the aforesaid first activation - variation means 11.

These forced alignment means 15 allow to position, or align, the operating modes S1, S2, S3, S4...Sn of the second setting level HD2 of each handpiece 18 on the corresponding operating mode selected on the handpiece 18 chosen on each occasion by the operator.

In other words, if the physician decides to activate an operating mode related to a particular treatment (surgery, for instance) which may be mode S1 (see Figure 3) of the handpiece 18a selected by the physician, then the operating modes of the remaining handpieces 18 will automatically align themselves onto their corresponding mode S1: in this way, each handpiece 18 selected thereafter shall already be aligned on operating mode S1 with no need for the physician to intervene on the activation - variation means 11 (see also Figure 5).

Obviously if the same physician needs to perform a subsequent treatment, different from the previous one and thus with a different operating mode from the handpiece 18 selected at that moment, for instance S3, all the other handpieces 18 will automatically set themselves to the related mode S3. In practice the means 15, if activated, as can be seen in the diagram in Figure 5, by-pass the first setting HD1 and lock the operating modes of the handpieces 18 onto the selected one, whilst their deactivation (see Figure 4) maintains active the function of the first setting HD1 described above for each individual handpiece 18.

The activation or deactivation of the forced alignment means 15 can be stored in the third setting level HD3 of each user unit A, B...N according to the habits or operating requirements of the physician using the dental unit at that moment.

In order further to complete the physician's personalisation of the operating configuration of the dental unit, which comprises a chair 16 adjustable in height and inclination and fitted with related means 17 for controlling the positions the chair itself can assume (only shown schematically here), the microprocessor unit 7 provides for the storage, by the memory HD, of a series of operating modes P1, P2, P3, P4...Pn related to different configurations of the chair 16 in the second setting level HD2. This storage of operating modes P1, P2, P3, P4...Pn of the chair 16 by the memory unit HD can be combined in the third setting HD3 of each user group A, B...N: in this way also the operating mode P1, P2, P3, P4...Pn of the chair 16 can be constrained to the corresponding operating mode S1, S2, S3, S4...Sn initially selected

by the physician on the handpiece 18, since the chair 16 too is subjected to the constraining action of the aforesaid forced alignment means 15.

By way of example Figures 2 and 3 show six memory blocks, in the memory unit HD, which can be recorded in the second setting level HD2, and six memory blocks recordable as the third setting level HD3.

With such an enhancement to the activation and monitoring system it is therefore possible to obtain a quicker and more complete utilisation of the dental unit by the physician, as well as to allow the programming and setting of the handpieces on multiple levels to let the physician avoid time consuming and laborious searches on the screen.

Moreover, the capability of aligning the operating modes of the handpieces and of the chair to the operating mode selected on each occasion allows the physician to make a single initial selection knowing that the other handpieces will already be perfectly aligned to the first one.

The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept. Moreover, all components may be replaced with technically equivalent elements.

#### Claims

1. Enhancement to an activation and monitoring system of a dental unit comprising, among other elements, a microprocessor unit (7) for monitoring said dental unit connected to and acting upon a display (8) for showing screens of operating function data related to selected major equipment (9) and of accessory function data related to auxiliary data (10) which do not depend on said screen displayed on each occasion; said data being within related viewing fields present in the same display and variable through activation - variation means (11, 12) connected to said microprocessor unit (7) according to the type of operation to be performed; to said microprocessor unit (7) being associated a memory unit (HD) able to record a first setting level (HD1), for at least each said major equipment item (9), comprising the last screen related to said operating function data and said accessory function data activated in correspondence with a last selection of the corresponding said equipment (9) and such as to call up said data and display anew the related last screen in correspondence with a subsequent selection of the same equipment; said memory unit (HD) also being able to record a second setting level (HD2), for at least each said main equipment item (9), comprising a series of operating modes (S1, S2, S3, S4...Sn) defining screens related to different operating and accessory function data, similar and not independent one from the other, which can be

called up progressively and displayed through said activation - variation means (11), characterised in that said microprocessor unit (7) is provided with means (50) for recording a third setting level (HD3) comprising a series of user groups (A, B...N) independent one from the other and each of which comprises a related said first and second setting level (HD1, HD2) selected by an individual operator; said third level (HD3) being able to be activated by a related recognition means (14) acting on said microprocessor unit (7), and in that it comprises means (15) for the forced alignment of at least said main equipment (9), which can be activated through related means (51), and able to position, or align, said operating modes (S1, S2, S3, S4...Sn) of said second setting level (HD2) of each said equipment item (9) onto the corresponding operating mode selected on each occasion.

2. Enhancement according to claim 1, characterised in that said alignment means (15) comprise their own activation or deactivation operating mode, which can be stored by said memory unit (HD) in said third setting level (HD3).
3. Enhancement according to claim 1, characterised in that said forced alignment means (15) can be activated or deactivated only in correspondence with said third setting level (HD3).
4. Enhancement according to claim 1, characterised in that said recording means (50) are associated to said microprocessor unit (7) and are comprised in said memory unit (HD).
5. Enhancement according to claim 1, characterised in that said dental unit comprises a chair (16) adjustable in height and inclination and equipped with related means (17) for controlling the positions which the chair itself can assume, characterised in that said microprocessor unit (7) provides for the storage, by said memory (HD), of a series of operating modes (P1, P2, P3, P4...Pn) related to different configurations of said chair (16).
6. Enhancement according to claim 1, wherein said dental unit comprises a chair (16) adjustable in height and inclination and provided with related means (17) for controlling the positions the chair itself can assume, and wherein said main equipment items (9) comprise a plurality of handpieces (18), characterised in that said microprocessor unit (7) provides for the storage, by said memory (HD), of a series of operating modes (P1, P2, P3, P4...Pn) related to different operating configurations of said chair (16); said memory (HD) also providing for the combination, in said third setting (HD3), of said selected configuration (P1, P2, P3, P4...Pn) of said

chair (16) by said user to the corresponding said user group (A, B...N).

7. Enhancement according to claim 1, wherein said dental unit comprises a chair (16) adjustable in height and inclination and provided with related means (17) for controlling the positions the chair itself can assume, and wherein said major equipment items (9) comprise a plurality of handpieces (18), characterised in that said microprocessor unit (7) provides for the storage, by said memory (HD), of a series of operating modes (P1, P2, PE, P4...Pn) related to different operating conditions of said chair (16); said memory (HD) also providing for the combination, in said third setting (HD3), of said selected configuration (P1, P2, P3, P4...Pn) of said chair (16) to the corresponding said user group (A, B...N); said forced alignment means (15) acting on said operating modes (S1, S2, S3, S4...Sn) of said handpieces (18) and on said operating modes (P1, P2, P3, P4...Pn) of said chair (16).
8. Enhancement according to claim 1, characterised in that in said memory (HD) a recording is provided of at least six independent and parallel memory blocks for said second setting level (HD2).
9. Enhancement according to claim 1, characterised in that in said memory (HD) a recording is provided of at least six independent and parallel memory blocks for said third setting level (HD3).

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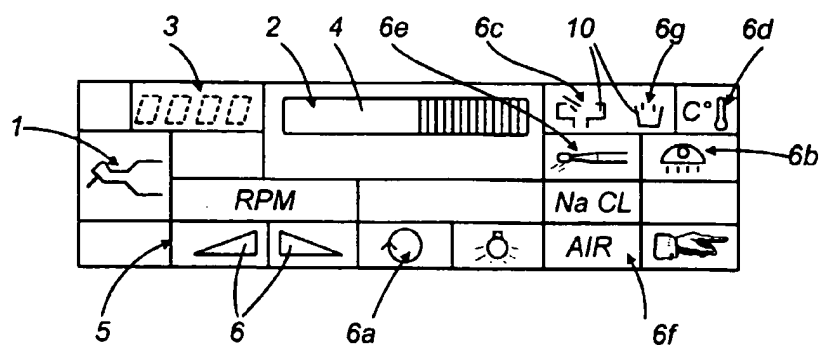
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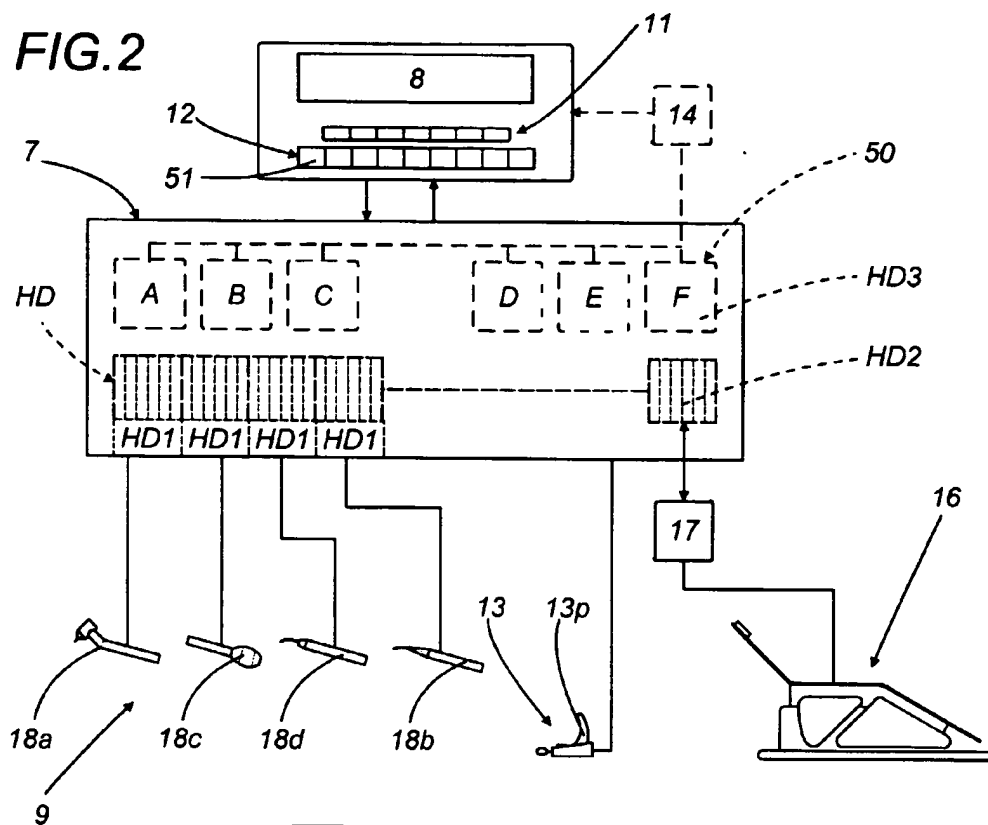
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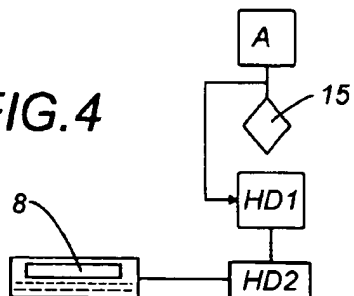
**FIG. 1**



**FIG.2**



**FIG.4**



**FIG.5**

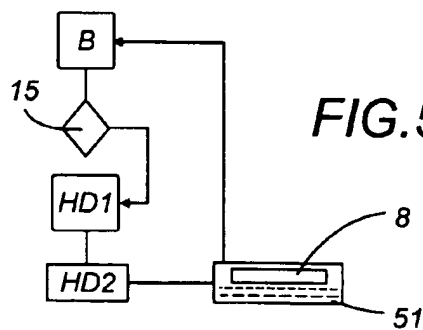


FIG.3

